$$x=(\tfrac{1}{2}a+\tfrac{1}{4}a)\cos\theta-(\tfrac{1}{4}a)\cos[(\tfrac{1}{2}a+\tfrac{1}{4}a)/(\tfrac{1}{4}a)]\theta,$$

$$\text{and } y=(\tfrac{1}{2}a+\tfrac{1}{4}a)\sin\theta-(\tfrac{1}{4}a)\sin[(\tfrac{1}{2}a+\tfrac{1}{4}a)/(\tfrac{1}{4}a)]\theta.$$

These are the well-known equations of an epicycloid, the radii of the fixed and rolling circles being $\frac{1}{2}a$ and $\frac{1}{4}a$ respectively.

B. The following geometrical solution is very much like one given in *Wood's Optics*, and was suggested by it.

Referring to the same figure, erect at P a perpendicular to CB, meeting OB at E. Comparing the similar triangles EPB and ODB, $ED : DB=BP : BD =1 : 2$.

If, then, upon EB, the half of OB, as diameter, a circumference be drawn its intersection with CB will be a point of the caustic. With O as center and EO as radius describe a semi-circle, intersecting the X-axis at K.

The $\angle EOK=\theta$, and arc $EK=\frac{1}{2}a\theta$.

Also, since $\angle EBP=\theta$, the angle at the center measured by arc $EP=2\theta$; and arc $EP=\frac{1}{4}a.2\theta=\frac{1}{2}a.\theta$.

Hence arc $EP=$arc EK.

The locus of P is, therefore, generated by the circle EPB rolling on the circle EK, the points P and K being originally in contact.

Of course the problem may be solved without assuming the property quoted from *Price*. In *Rice and Johnson's Differential Calculus* an excellent solution is outlined.

Also solved by *C. W. M. BLACK*, *S. H. WRIGHT*, and *B. F. FINKEL*.

PROBLEMS FOR SOLUTION.

ARITHMETIC.

97. Proposed by J. A. CALDERHEAD, M. Sc., Professor of Mathematics, Curry University, Pittsburg, Pa.

In what time will $4000 amount to $5134.96, interest at 6% payable annually?

*** Solutions of these problems should be sent to B. F. Finkel, not later than July 10.

GEOMETRY.

97. Proposed by CHAS. C. CROSS, Libertytown, Md.

Prove by pure geometry: The radius of a circle drawn through the centers of the inscribed and any two escribed circles of a triangle is double the radius of the circumscribed circle of the triangle.

98. Proposed by EDW. R. ROBBINS, Master in Mathematics and Physics, Lawrenceville School, Lawrenceville, N. J.

Construct a circle which shall pass through two given points and touch a given circle, (1) when the distance between the points is less than the diameter of the circle, and (2) when it is greater.

*** Solutions of these problems should be sent to B. F. Finkel, not later than July 10.